Embedded Training Solution
for the
Bradley Fighting Vehicle (BFV) A3

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Abstract

Subject Terms

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Classification of Abstract	Limitation of Abstract
unclassified	UU

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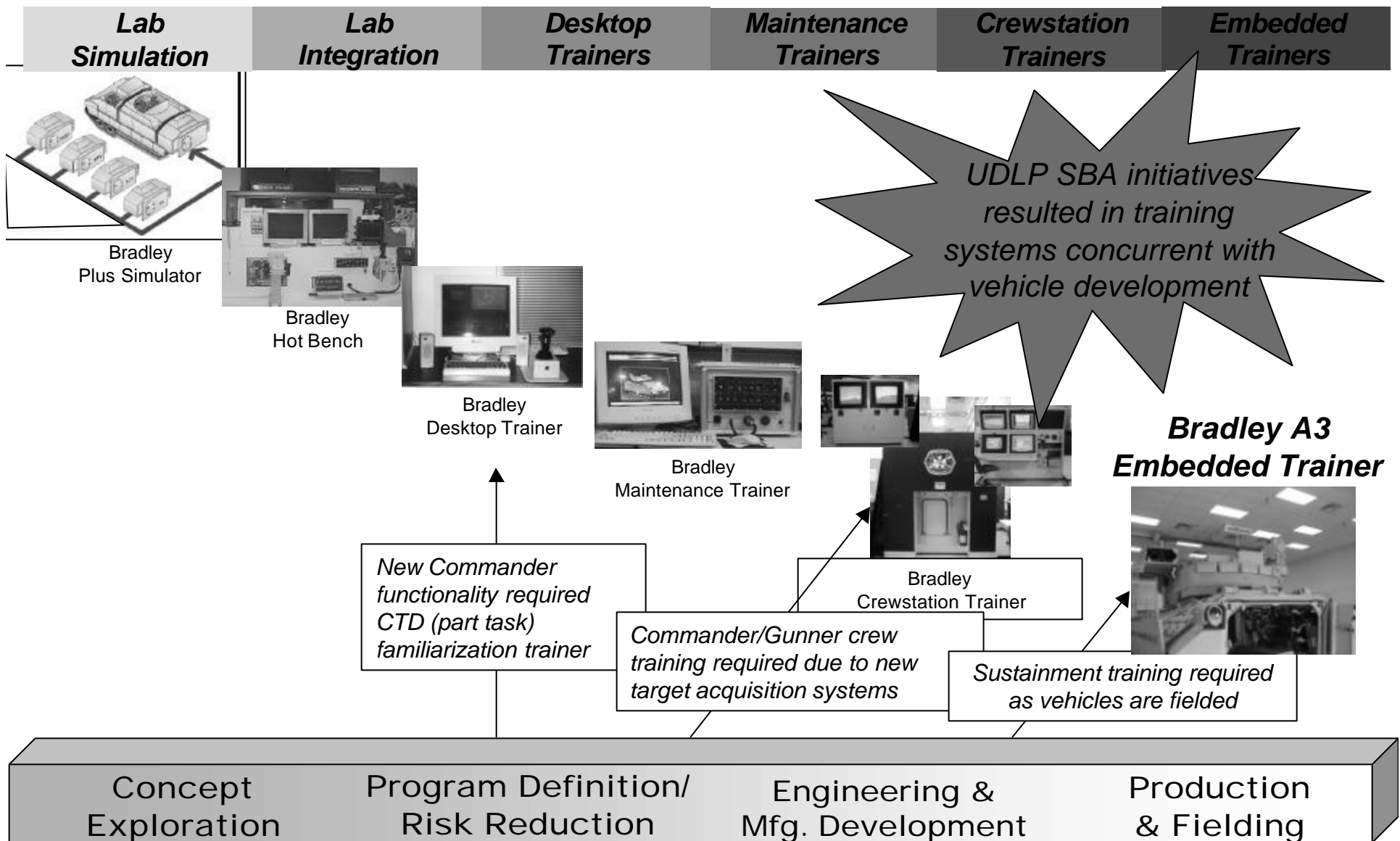# Overview

- Bradley Fighting Vehicle (BFV) A3 Training System Development
- United Defense's Approach to SMART and SBA initiatives
- Bradley A3 Embedded Trainer (BATS-E)
- BATS-E integration into platform
- SMART Applications to Bradley A3
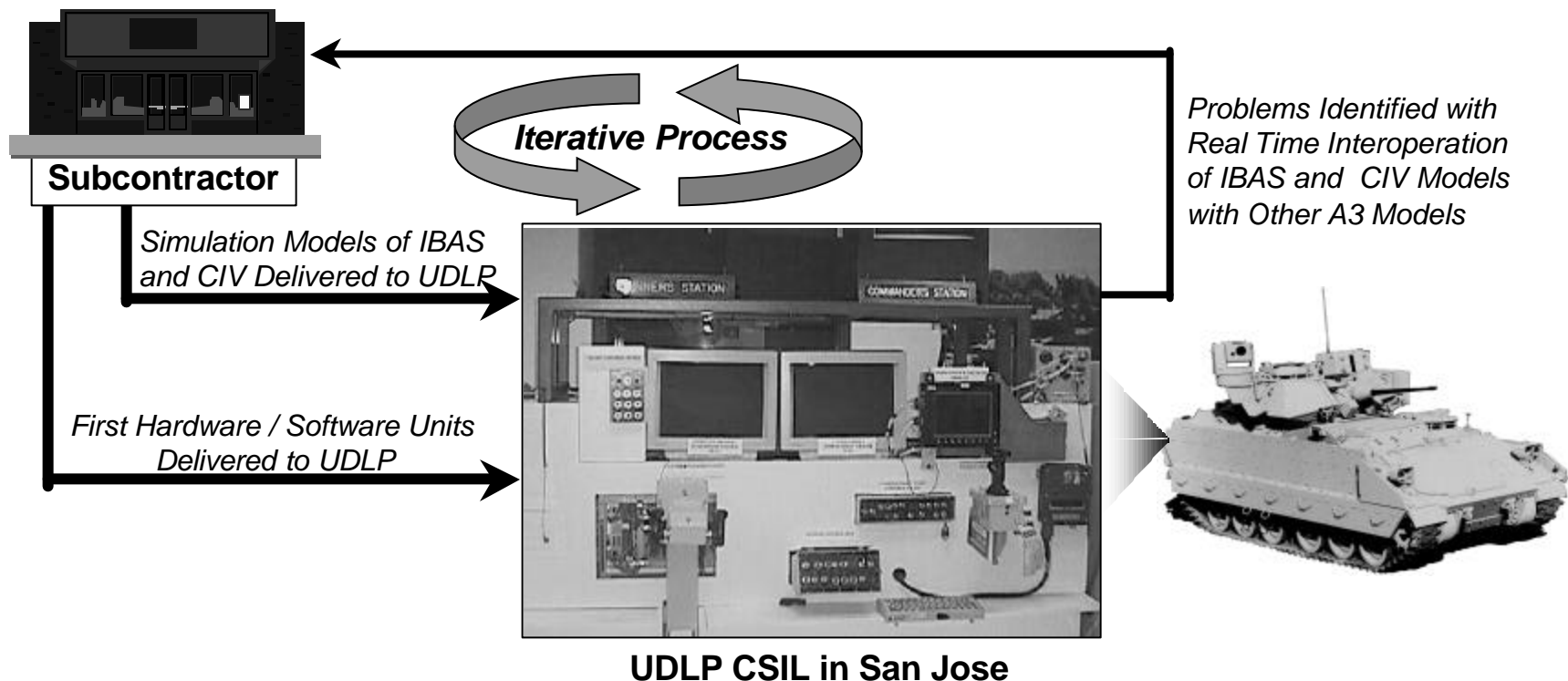
Bradley Training System Development

United Defense

Lab Simulation	Lab Integration	Desktop Trainers	Maintenance Trainers	Crewstation Trainers	Embedded Trainers

Bradley
Plus Simulator

Bradley
Hot Bench

Bradley
Desktop Trainer

Bradley
Maintenance Trainer

UDLP SBA initiatives resulted in training systems concurrent with vehicle development

Bradley A3 Embedded Trainer

Bradley
Crewstation Trainer

New Commander functionality required CTD (part task) familiarization trainer

Commander/Gunner crew training required due to new target acquisition systems

Sustainment training required as vehicles are fielded

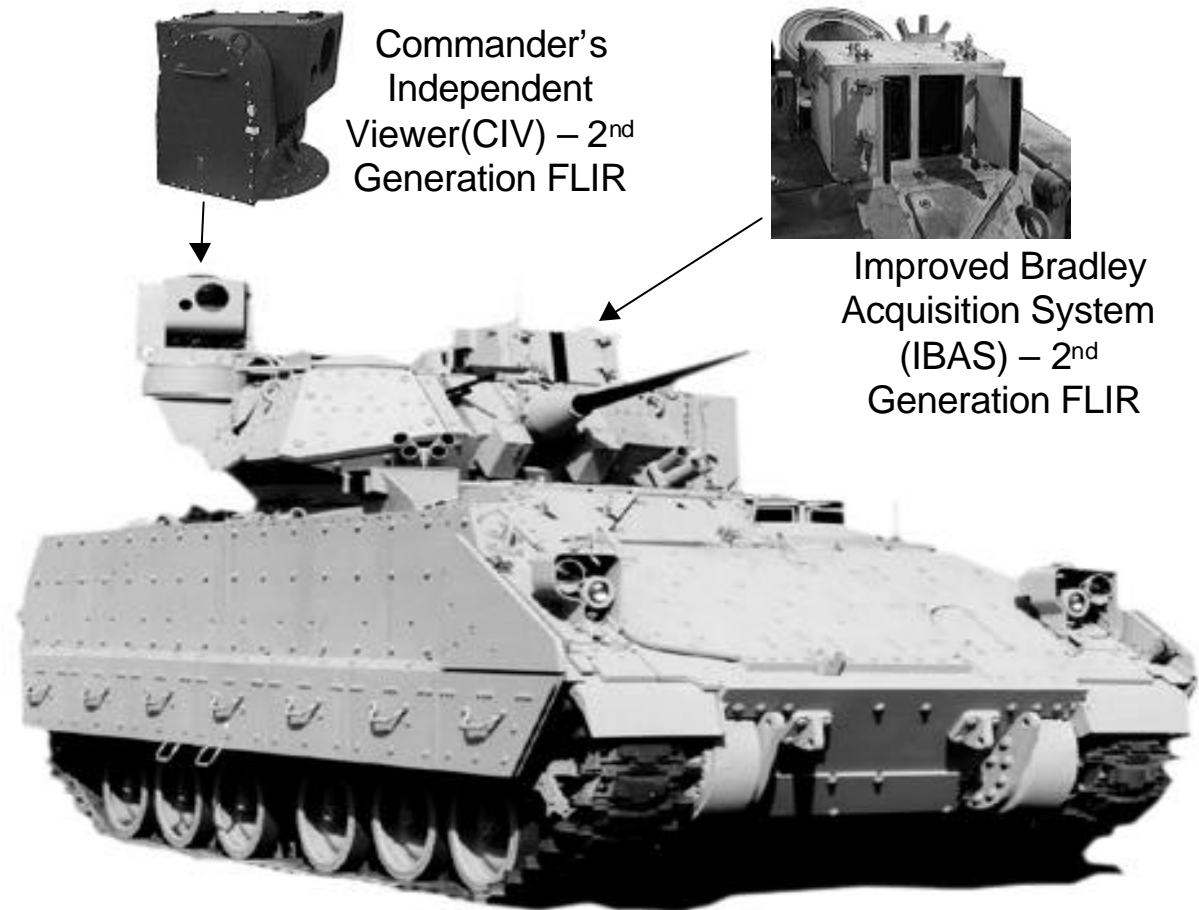| Concept Exploration	Program Definition/ Risk Reduction	Engineering & Mfg. Development	Production & Fielding

SBA Enhances UDLP Development

- Significantly reduces integration time, cost, and program risk
- Design flaws/problems are identified early - before commitment to design
- Simulated models accurately represent actual hardware
  - Allows for use of actual vehicle software in training devices
  - Training Device software is easier to integrate into real vehicle

Subcontractor

Iterative Process

Problems Identified with Real Time Interoperation of IBAS and CIV Models with Other A3 Models

Simulation Models of IBAS and CIV Delivered to UDLP

First Hardware / Software Units Delivered to UDLP

UDLP CSIL in San Jose

Bradley Fighting Vehicle (BFV) A3

United Defense

- Integrated Force XXI Battle Command Brigade and Below (FBCB2) on-board vehicle

- 1553 Digital Databus

- On-board diagnostics system

- Training Device Interface Port

- Training Mode on Vehicle Software

Commander's Independent Viewer(CIV) – 2nd Generation FLIR

Improved Bradley Acquisition System (IBAS) – 2nd Generation FLIR

BFV A3 is a modernized legacy system that facilitates embedded training by design….

BATS-E Concept

Bradley A3

Bradley A3 immersed in the synthetic battlefield using proven simulation technology

Bradley A3 Embedded Gunnery Training Device
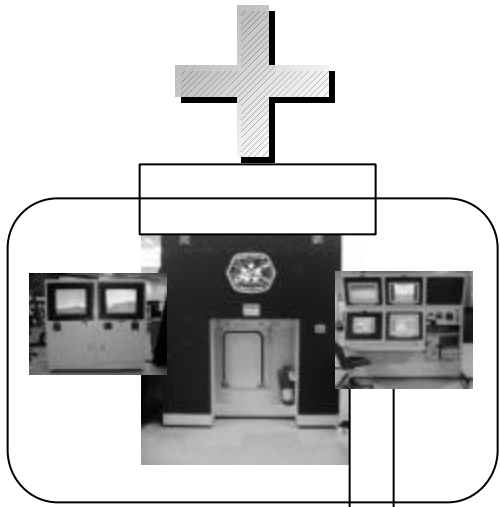
Bradley Advanced Training System
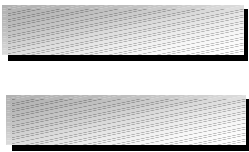
BRADLEY A3 IMMERSED IN THE SYNTHETIC BATTLEFIELD

Bradley A3 Embedded Trainer Functionality

United Defense

- **Target Generator**
  - ModSaf Version 3.0 used to place targets on Database (allows for interoperability with other simulation devices

- **Actual Vehicle Tactical Code and Fire Control Solution**
  - Realistic interaction between user and vehicle

- **CCTT Interoperability**
  - CCTT Primary Two (P2) Terrain Database

- **Limited Gunnery Functionality**
  - Degraded modes, back-up sight

- **2 main sights, camera, 2nd Gen FLIR**
  - Simulates Day TV and FLIR, only in sights w camera view

- **Image Generation**
  - PC Based, one PC per video channel

- **Exercise Management**

Bradley A3 Gunner
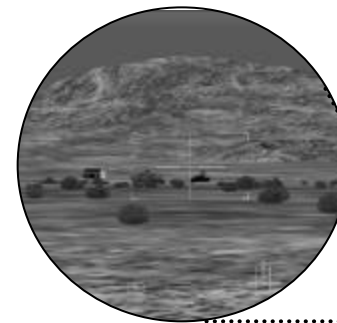
Bradley A3 Commander

Vehicle Design
# Facilitates ET Development

United Defense

- ## 1553 Digital Data Bus Architecture
  - Allows for monitoring of all communications between hardware and software on the vehicle.
  - BATS simulation uses simulated and actual 1553 data bus architecture

- ## Video In/Video Out
  - Connection in place for video input and output to and from two main sights
  - Crew interaction (generates1553 digital data) drives synthetic visuals through primary sights

- ## Power Out
  - Vehicle power provides power for BATS-E appended simulation prototype

- ## Ethernet Export Display
  - Export of exercise control software on Commander's Tactical Display (CTD) allows commander to control all aspects of simulation from his normal user's interface

- ## Training Mode Software
  - Leveraged Precision Gunnery System (PGS) training mode embedded in the BFV A3 tactical (fire control) software
  - Software allows for control of various indicator LEDs, ammo tracking, and sounds
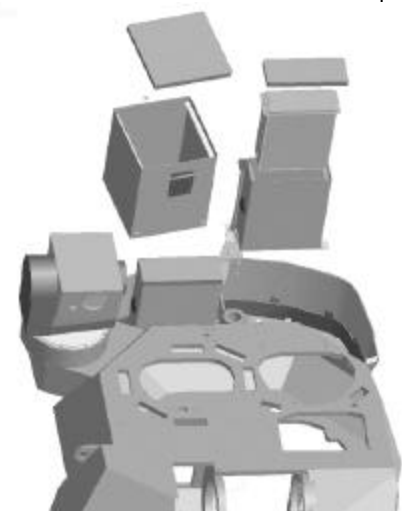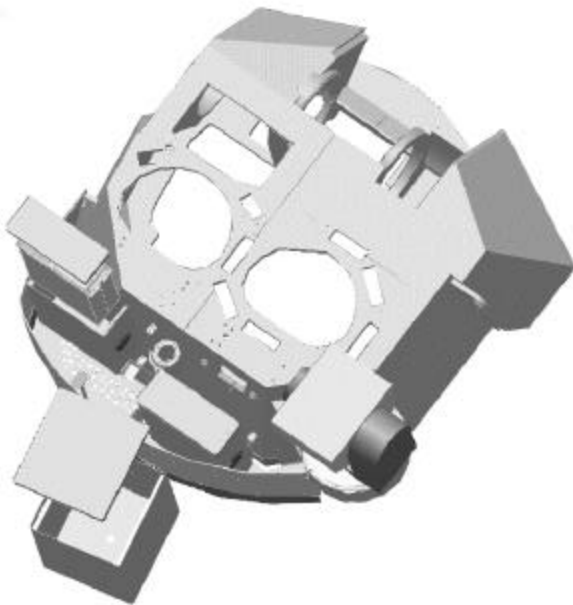
BATS-E Appended Equipment

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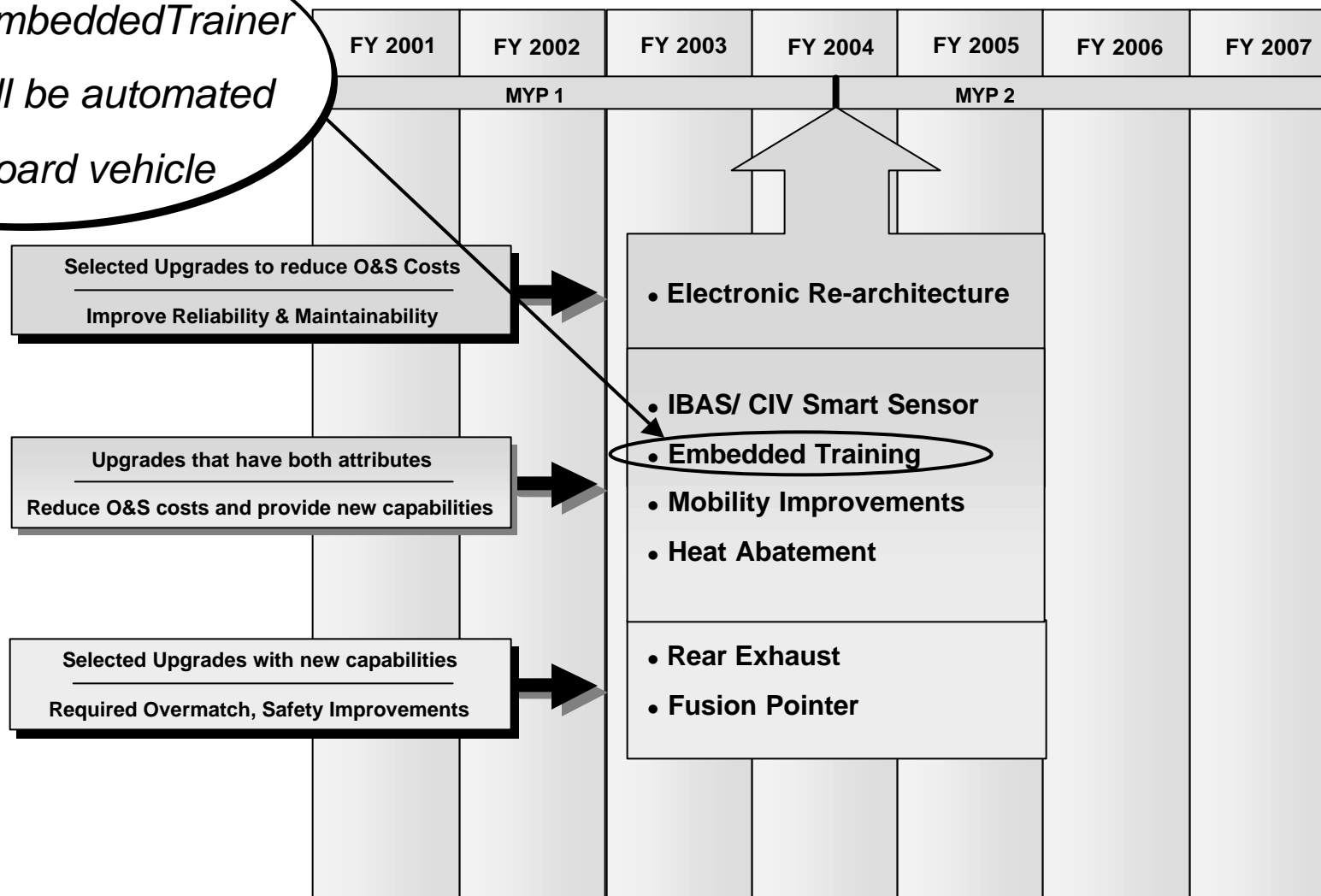*Commercial PC hardware running BATS simulation software...*
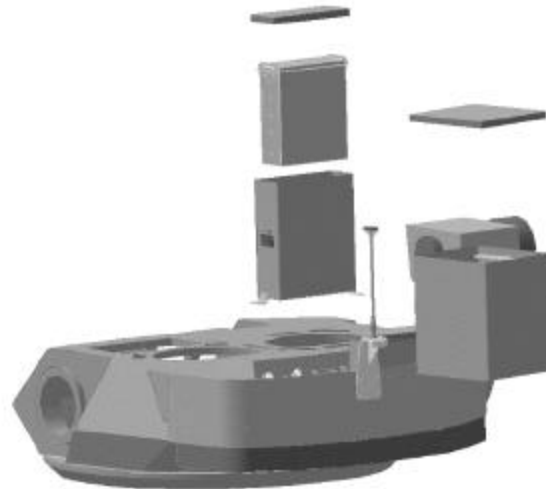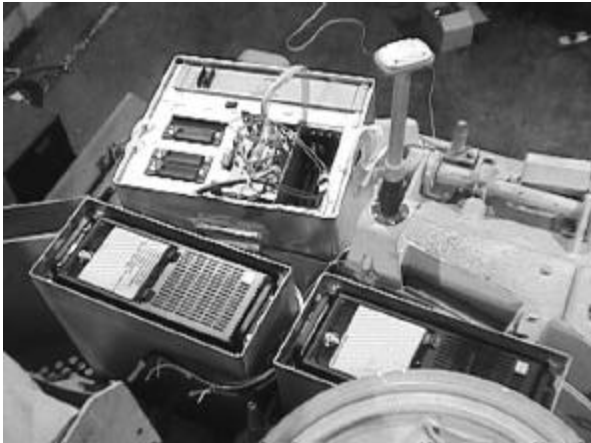
.....and interfacing with vehicle video and 1553 data bus through Training Device Interface Port (TDIP)

Bradley A3 Technology Insertion Plan

United Defense

Bradley A3 EmbeddedTrainer capability will be automated and on-board vehicle

FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
	MYP 1			MYP 2		

Selected Upgrades to reduce O&S Costs
Improve Reliability & Maintainability

- Electronic Re-architecture

Upgrades that have both attributes
Reduce O&S costs and provide new capabilities

- IBAS/ CIV Smart Sensor
- Embedded Training
- Mobility Improvements
- Heat Abatement

Selected Upgrades with new capabilities
Required Overmatch, Safety Improvements

- Rear Exhaust
- Fusion Pointer

SMART Application to Bradley A3

- Applying SMART methodologies provides:
  - Training systems concurrent with vehicle software and hardware
  - Rapid prototyping of new training systems (i.e. Crewstation Trainer)
  - Prototyping allows for requirements evaluation and development

- Other added SMART benefits
  - Test earlier in the acquisition / development cycle
  - Conduct more extensive and comprehensive testing/planning
  - Reduced testing costs and training system costs
  - Training capabilities are concurrent with platform capabilities

SMART methodologies transition concurrent development of embedded training systems onto weapon system platforms